Chemistry / Physics Review

Short Answer

1. Give the compound name or formula as required.

K_2S	_____	$AlBr_3$	_____
Ag_2O	_____	ZnF_2	_____
sodium oxide	_____	calcium nitride	_____
lithium iodide	_____	potassium phosphide	_____
beryllium chloride	_____	magnesium hydride	_____

2. Give the compound name or formula as required.

$CaCl_2$	_____	Sr_3P_2	_____
BaI_2	_____	Na_3N	_____
hydrogen chloride	_____	potassium oxide	_____
aluminum nitride	_____	sodium fluoride	_____
zinc sulfide	_____	potassium bromide	_____

3. Give the compound name or formula as required.

PbI_2	_____	SnF_4	_____
Fe_2O_3	_____	Cu_2S	_____
iron(II) bromide	_____	tin(II) phosphide	_____
copper(I) nitride	_____	lead(IV) oxide	_____

4. Give the compound name or formula as required.

$AgNO_3$	_____	$Pb(ClO_3)_2$	_____
$CaSO_4$	_____	K_3PO_4	_____
magnesium carbonate	_____	calcium hydrogen carbonate	_____
copper(II) sulfate	_____	iron(II) hydroxide	_____

5. Give the compound name or formula as required.

Na_2CO_3	_____	$Sn(NO_3)_2$	_____
$Cu(OH)_2$	_____	$Al(HCO_3)_3$	_____
zinc chlorate	_____	calcium phosphate	_____
potassium sulfate	_____	lead(IV) carbonate	_____

6. Use sketches of Bohr diagrams to show how hydrogen and nitrogen atoms form a stable molecule. Use as many atoms as are necessary.

7. Give the compound name or formula as required.

SO_2	_____	CF_4	_____
NBr_3	_____	CS_2	_____

	_____		_____
carbon dioxide	_____	nitrogen phosphide	_____
silicon tetrabromide	_____	chlorine oxide	_____

8. Fill in the blanks in the following statements.
   The chemical equation: $Na + O_2 \rightarrow Na_2O$ is called a(an) (a) _____ equation because it is not balanced. In order to balance the equation, only the coefficients, that is the numbers that are written (b) _____ the formulas in the equation are changed. After balancing, the chemical (c) _____ remain the same.
   (d) The balanced chemical equation is: ____ Na + _____ $O_2 \rightarrow$ _____ Na_2O

9. Balance the following equation: $PbS + O_2 \rightarrow PbO + SO_2$

10. Balance the following equation: $MnO_2 + HCl \rightarrow MnCl_2 + H_2O + Cl_2$

11. Balance the following equation: $Cu + H_2SO_4 \rightarrow CuSO_4 + H_2O + SO_2$

12. Balance the following equation: $Al_4C_3 + H_2O \rightarrow Al(OH)_3 + CH_4$

13. Pentane, C_5H_{12}, is a hydrocarbon gas easily kept as a liquid under pressure.
    a. Write out a word equation for the complete combustion of pentane.
    b. Write out the balanced chemical equation for the complete combustion of pentane.
    c. What else is produced that is not written as a chemical formula?

14. Carbon black, a form of soot, is used in making car tires. It is produced by the incomplete combustion of a hydrocarbon such as methane, CH_4. Write out a balanced equation for the incomplete combustion of methane that produces carbon black.

15. a. Complete the following equation and balance it.
    $C_4H_8 + O_2 \rightarrow$ _____
    b. Classify the reaction type

16. Complete the following statements concerning the chemical reactions involved in lighting a match.
    When a match is struck on a rough surface (a) _____ results from friction. This causes a phosphorous fuel to react with (b) _____ in the air, producing heat, which in turn causes the potassium chlorate, $KClO_3$, to (c) _____, producing (d) _____, which quickly reacts with the rest of the fuel in the match.

17. When sugar, $C_6H_{12}O_6$, is strongly heated, water is driven off and the element carbon is left (something similar occurs when toast burns).
    a. Write out a balanced chemical reaction for strongly heating sugar.
    b. Classify the reaction type.

18. Balance and classify each of the following as either a synthesis or a decomposition reaction.
    a. $HgO \rightarrow Hg + O_2$
    b. $Al + O_2 \rightarrow Al_2O_3$
    c. $SO_3 + H_2O \rightarrow H_2SO_4$

19. Classify each of the following as either a synthesis or a decomposition reaction.
    a. $Ca + Cl_2 \rightarrow CaCl_2$
    b. $CaCO_3 \rightarrow CaO + CO_2$
    c. $MgO + H_2O \rightarrow Mg(OH)_2$
    d. $2\ NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$

20. Write out balanced chemical equations for each of the following reactions and classify the reaction type.
    a. Sodium and oxygen react to form sodium oxide.

b. Silver oxide when heated produces oxygen and silver.
c. Magnesium carbonate when heated produces magnesium oxide and carbon dioxide.
d. Bromine reacts with aluminum to form aluminum bromide.

21. Classify each of the following reactions.
    a. $2\ KI + Pb(NO_3)_2 \rightarrow PbI_2 + KNO_2$
    b. $Fe + CuSO_4 \rightarrow Cu + FeSO_4$
    c. $2\ Li + H_2O \rightarrow 2\ LiOH + H_2$
    d. $Ca(OH)_2 + 2\ HBr \rightarrow 2\ H_2O + CaBr2$

22. Classify each of the following reactions.
    a. $Cu + 2\ AgNO_3 \rightarrow 2\ Ag + Cu(NO_3)_2$
    b. $(NH_4)_2SO_4 + CaCl_2 \rightarrow CaSO_4 + 2\ NH_4Cl$
    c. $ZnI_2 + Cl_2 \rightarrow I_2 + ZnCl_2$
    d. $Na_2S + Pb(NO_3)_2 \rightarrow 2\ NaNO_3 + PbS$

23. a. Complete the following equation and balance it. $Bi_2O_3 + H_2 \rightarrow$
    b. Classify the reaction type.

24. Fill in the blanks in the following statements concerning the collision model for chemical reactions. Chemical reactions only occur if the reactant molecules (a) _____. The rate of reaction can be increased by increasing the (b) _____ of collisions, or by (c) _____ the fraction of collisions that are (d) _____.

25. Complete the following statements concerning acids by filling in the blanks.
    Acids are (a) _____ tasting. They are (b) _____ in water, producing a solution that can (c) _____ electricity. When acids react with active metals, they produce the gas (d) _____. When they react with compounds containing (e) _____ groups, they release carbon dioxide gas.

26. Complete the following statements concerning bases by filling in the blanks.
    Bases are (a) _____ tasting and feel (b) _____. They are (c) _____ in water, producing a solution that can conduct (d) _____. Bases may also be described as (e) _____.

27. Hydrochloric acid and sulfuric acid (hydrogen sulfate) are sample acids and sodium hydroxide and aluminum hydroxide are sample bases.
    a. Under the headings of "Acids" and "Bases" write out the chemical formulas of these compounds.
    b. What part of the acid formulas is common to both acids?
    c. What part of the base formulas is common to both bases?
    d. If the common parts of acids and of bases are combined, what is the product?

28. a. Write balanced equations representing the dissolving of potassium hydroxide and hydrochloric acid (hydrogen chloride) in water. Be sure to include the electrical charges on any ions involved.
    b. What is the ion associated with acids?
    c. What is the ion associated with bases?

29. Write out the corresponding name or formula for each of the following compounds and identify each as either an acid, a base, or neither.
    a. calcium hydroxide
    b. hydrobromic acid
    c. H_2CO_3
    d. magnesium chloride
    e. HNO_3

f. LiOH

30. In 1979, Bryan Allen pedalled the *Gossamer Albatross* aircraft 35.0 km across the Engish Channel in a time of 169 minutes.
(a) Calculatethe average speed of the aircraft in km/h.
(b) Assuming that he maintained this same average speed, what total distance could he cover in 5.3 hours?

31. You are taking a trip from Oshawa to Niagara Falls in your family car. The total distance from Oshawa to Niagara Falls is 170 km. In the pursuit of science, you decide to measure certain physical quantities. The odometer on the car reads 28 456.0 km at the beginning of the time interval measured, and at the end of the time interval of 1.35 hours it reads 28 577.5 km.

(a) Determine the average speed of the car during this time period in kilometres per hour.
(b) Assuming this average speed will be maintained, how long will it take to travel to Niagara Falls from Oshawa in hours?

32. It has been proven that one-quarter of all vehicle accidents occur because the driver is distracted. "Drive-Thru'" dining is a convenience we take for granted in our modern society. Assume that a driver was eating french fries while driving and dropped one of the french fries on the seat. He looks down, sees the fry, and reaches to pick it up. It takes him approximately 3.0 s to look and pick up the french fry.
(a) How far in metres does the car travel in this time if he is travelling at a constant speed of 100 km/h?
(b) What is the benefit of eating while driving?
(c) What are some risks involved when a person is eating while driving?
(d) What are some things a person could do to reduce the risks when eating and driving?

33. Two runners, Mike and Ling, compete in a 2000 m race. Ling has three times the average speed of Mike in a section in the race.
a. Compare their distances travelled during the same time interval at this section of the race.
b. Compare their times required to run the same distance.
c. How would their distance-time graphs compare? Sketch the graphs to illustrate your answers.

34. A truck leaves Gander, Newfoundland, for St. John's, Newfoundland. The distances and times from Gander to St. John's are listed in the table below.

Time (hours)	Distance (km)
0.0	0.0
1.0	90.0
2.0	200.0
3.0	250.0
4.0	380.0
5.0	500.0

a. Plot a distance-time graph using the information in the table. Draw a best-fit straight line.
b. Using your graph, find the distance travelled after 1.5 hours.
c. Using your graph, find the time required to travel 400 km.
d. Was the speed constant during the truck's trip from Gander to St. John's? How do you know?

35. Sketch the following distance-time graph. A bike rider travels at a constant speed of 5.0 m/s for 6 seconds and then suddenly stops for 2 seconds.

36. A jet is taking off. It is moving at 10.00 km/h and accelerates to 1 000 km/h^2 for 30.0 s. What is the final speed at the end of the 30.0 s?

37. A roller blader is skating down a hill at 4.0 m/s and accelerates to 15.0 m/s in a time of 5.2 s.
    a. Calculate the average acceleration of the roller blader.
    b. What does this acceleration mean?

38. A cyclist starts from rest and speeds up to 6.0 m/s in 4.0 s. What is her average acceleration?

39. A car accelerates at 8.1 (km/h)/s. How long in seconds would it take to accelerate from 20.0 km/h to 50.0 km/h?

40. Complete the analysis of the following investigation.
    Question:
    Which car has the least average acceleration?
    Design:
    The vehicles were accelerated from rest to 100 km/h.

Car	Initial Speed (km/h)	Final Speed (km/h)	Time (s)
A	0	100	8.3
B	0	100	6.4
C	0	100	9.7

    Analysis:
    a. Calculate the average acceleration for each car.
    b. Which car has the least average acceleration?

41. A shark travelling at 2.0 m/s accelerates at 4.3 m/s^2 to a final speed of 15.0 m/s. What is the elapsed time during the acceleration?

42. A baseball player is stealing second base travelling at 4 .0 m/s and accelerating at 2.0 m/s^2 for 3.0 s. What is the final speed at the end of the 3.0 s?

43. A baseball is thrown by a pitcher at a speed of 144 km/h and comes to rest in the catcher's glove. The acceleration of the ball is –150 000.0 km/h^2. What time in seconds does it take to get from the pitcher to the catcher?

44. a. Plot the following tables on two separate speed-time graphs.

Karen's Acceleration	
Speed (m/s)	Time (s)
3.0	0.0
6.0	2.0
9.0	4.0
12.0	6.0

Jamal's Acceleration	
Speed (m/s)	Time (s)
0.0	0.0
1.5	3.0
3.0	6.0
4.5	9.0

    b. From the graphs calculate Karen's and Jamal's accelerations. Who has the greater acceleration?

45. Matthew rides his bike to school. His speed at different times is shown on the graph.
    a. Calculate the accelerations from 0 to 30 minutes, 30 to 40 minutes, and 40 to 60 minutes.
    b. List, in order of largest to smallest, the distances travelled in these time intervals.

46. Sketch and label the following graphs:
    a. a distance-time graph showing constant speed;
    b. a speed-time graph showing constant speed;
    c. a speed-time graph showing constant acceleration.

47. How can you tell from a speed-time graph if an object is accelerating?

48. The Toronto Argonaut passes the football from the Toronto 5-yard line to the 20-yard line and then loses 5 yards on the next play. Using the Toronto 5-yard line as the reference point, what is the ball's:
    a. position after the pass?
    b. final position?
    c. final displacement?
    d. total distance travelled?

49. Represent the displacement of 25 km [E] as a vector using a scale of 1cm=10 km.

50. Represent the displacement of 40 km [S] as a vector using a scale of 1cm=10 km.

51. Distinguish, in words, the difference between position and displacement.

52. a. State the rule for adding vectors in a vector diagram?
    b. What is the rule for drawing the resultant vector in a vector diagram?

53. Jim rides his bike 3 km west, 15 km east, and then 4 km west. What is the resultant displacement at the final position?

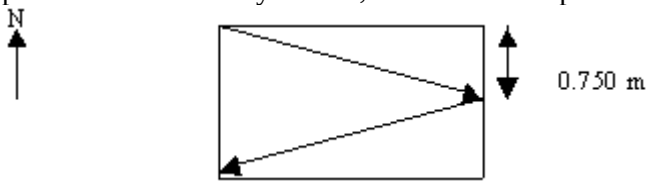
54. George runs 3.5 km [E], 1.5 km [E], and then 4.0 km [W]. What is the resultant displacement at the final position?

55. Barry travels 3 km [E] and then 4 km [S]. Draw a vector diagram to determine Barry's displacement. Do not forget to measure the angle for direction.

56. Tim travels 15 m [30° E of N], 20 km [S] and then 5 km [W]. Draw a vector diagram to determine Tim's displacement. Do not forget to measure the angle for direction.

57. A boat travels 400 km [W] and then 350 km [S]. Draw a vector diagram to determine Tim's displacement. Do not forget to measure the angle for direction.

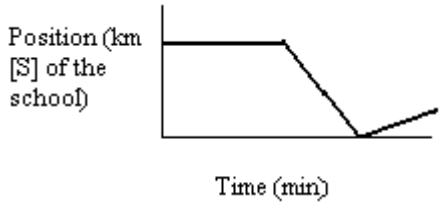
58. Larry Shoots a billiard ball to the other end of the table and it rebounds into the corner pocket as shown. If the pool table is 1.50 m by 3.00 m, what are the displacement of and the distance travelled by the ball?



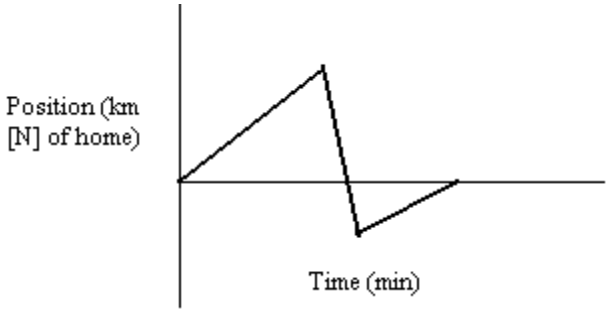
59. Draw a vector to represent 30 km [20° E of N]

60. A cross-country skier skis 150 m [E] in 40 s for the first part of his activity and then skis 500 m [W] in 350 s in the second part of his activity.
    a. What is his velocity in the first part of his activity?
    b. What is his velocity in the second part of his activity?
    c. What is his average velocity for the whole activity?

61. Write a brief description about the motion of the following object and include the direction and relative size of the different velocities.



62. Write a brief description about the motion of the following object and include the direction and relative size of the different velocities.



63. a. Draw a position-time graph for the motion of the air puck from the table below.

Total Time (ms)	Position (mm[N])
0.0	0
10.0	37
20.0	62
30.0	125
40.0	162

b. Draw a line of best fit.
c. Determine the instantaneous velocity at 20.0 ms and 40.0 ms using the best-fit line.
d. What is the average velocity of the air puck for the total time period of 40.0 ms?
e. What do you notice about the instantaneous and average velocities? Why is this so?

64. Explain how the slope of a straight-line segment on a position-time graph is calculated.

65. Explain how the slope of a tangent to a point on a curved line on a position-time graph is calculated.

66. Explain the meaning of a positive slope on a position-time graph.

67. Explain the meaning of a negative slope on a position-time graph.

68. Explain the meaning of a zero slope on a position-time graph.

69. What is the average velocity during the interval that a ball is moving at 10 m/s [SE] and the ball comes to rest 2.0 s later? Assume southeast direction is positive.

$\vec{v}_1 = 10 \text{ m/s [SE]}$

$\vec{v}_2 = 0 \text{ m/s}$

$\vec{v}_{av} = ?$

$$\vec{v}_{av} = \frac{\vec{v}_1 + \vec{v}_2}{2}$$

$$\vec{v}_{av} = +\frac{10 \text{ m/s}}{2}$$

$\vec{v}_{av} = +6.0 \text{ m/s}$

70. Zane is on his way home walking at 4.0 km/h [N] when he hears a sound behind him. He accelerates to 10 km/h [N]. What is his average velocity?

71. You have two blocks to walk to school. There is a traffic light at each of the two intersections and both times you have to stop for a red light. Sketch a velocity-time graph to illustrate your trip to school.

72. A car leaves Kennedy Road travelling at 60 km/h [N] and slows down behind a tractor-trailer to a velocity of 30 km/h [N] in 3.0 s. What is the average velocity during this constant acceleration?

73. What is the acceleration of the turtle in the following velocity-time graph? (Find the slope of the line.) Assume up is positive and down is negative. The acceleration should be in m/s^2.

74. You walk home at a constant velocity and then you slow down and stop for a few minutes. Next you increase your velocity to return to the velocity you were at before you stopped. Sketch a velocity-time graph illustrating your journey toward home.

75. You are in a car that is travelling at a velocity of 40 km/h [N]. The car suddenly speeds up to 70 km/h [N] in 4.0 s. Calculate the acceleration of the car in that 4.0 s.

76. A jet starts from rest and accelerates at 36 000 km/h^2 [right] in 40.0 s. Calculate the final velocity of the jet after 40.0 s. Make certain the final velocity is in km/h.

77. A motorcycle rider accelerates at 5.00 m/s2 [left] and reaches a final velocity of 35.0 m/s[left] in 5.00 s. What was her initial velocity?

78. You throw a penny into a wishing well with a velocity of 10 m/s [down]. The penny accelerates at 10 m/s^2 [down] to a final velocity of 20 m/s [down]. How long did this take in seconds?

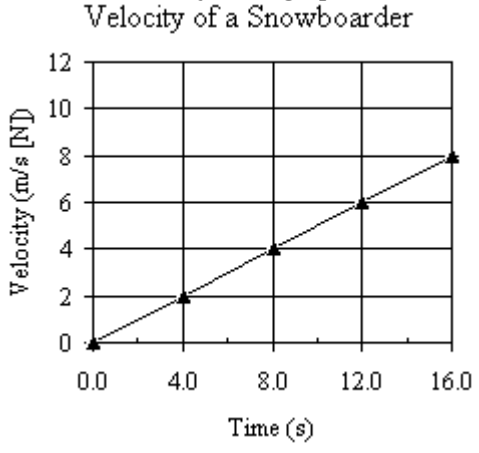
79. A bike is travelling at + 10 m/s and the acceleration of the bike is – 2.5 m/s 2. What is the significance of the negative sign of the acceleration to the velocity?

80. A cat accelerates constantly from 2.0 m/s [W] to 7.0 m/s [W] in 3.4 s. Find the displacement of the cat during this 3.4 s period.

81. A small child throws a ball 2.3 m [up] in the air. It accelerates from 20 m/s [up] as it leaves his hand to 15 m/s [up]. Calculate how long this takes.

82. A rabbit accelerates constantly from rest at 1.0 m/s^2 [E] for a total displacement of 15.0 m [E]. How long did this acceleration last?

83. From the velocity-time graph below, calculate the displacement of the object represented by the graph.



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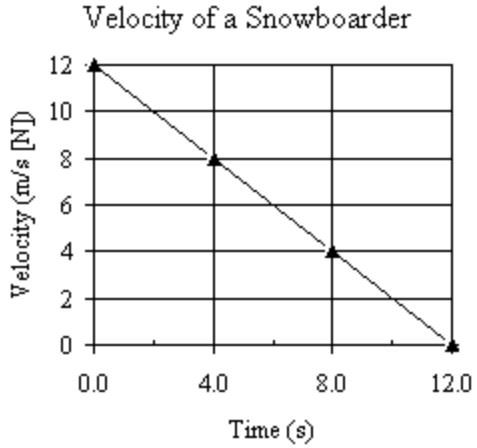
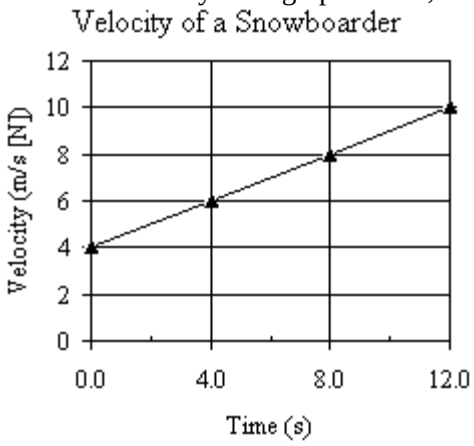


85. From the velocity-time graph below, calculate the displacement of the object represented by the graph.



86. What two techniques did Galileo use to determine that acceleration due to gravity is constant?

87. A water balloon is dropped from rest to the sidewalk below. It takes 15.0 seconds for the water balloon accelerating at 9.81 m/s^2 [down] to reach the sidewalk. Calculate the velocity of the water balloon as it hits the sidewalk.

88. A ball falls from rest to a velocity of 20 m/s [down] in 10 s. Calculate the average velocity of the ball in this time period.